

We claim:

- 1 1. A method of fabricating a spatial light modulator, comprising:
2 forming cavities in a first side of a first substrate;
3 fabricating electrodes on a first side of a second substrate;
4 bonding the first side of the first substrate to the first side of the second substrate; and
5 forming hinges, connectors, and mirror plates on a second side of the first substrate
6 after bonding the first side of the first substrate to the first side of the second
7 substrate.
- 1 2. The method of claim 1, wherein the first substrate is a single continuous piece of a
2 material.
- 1 3. The method of claim 2, wherein the first substrate is single crystal silicon.
- 1 4. The method of claim 1, further comprising depositing a reflective layer on the second
2 side of the first substrate prior to forming hinges, connectors, and mirror plates on the second
3 side of the first substrate.
- 1 5. The method of claim 1, further comprising, prior to bonding the first side of the first
2 substrate to the first side of the second substrate, fabricating addressing and control circuitry on
3 the first side of the second substrate.
- 1 6. A method of fabricating a plurality of mirrors for a spatial light modulator,
2 comprising:
3 generating a first mask defining areas to be etched from a first side of a first substrate;
4 removing material in the areas on the first side of the first substrate defined by the
5 first mask;
6 thinning a second side of the first substrate to a predetermined thickness;
7 creating a reflective surface on the second side of the first substrate;

8 generating a second mask defining areas to be etched from the second side of the first
9 substrate; and
10 removing material in the areas on the second side of the first substrate defined by the
11 second mask to form a plurality of hinges and mirror plates.

1 7. The method of claim 6, wherein the material is removed in the areas of the first
2 substrate defined by the first mask to form a plurality of cavities in the first side of the first
3 substrate.

1 8. The method of claim 6, wherein removing material in the areas of the first substrate
2 defined by the first and second masks comprises etching the first substrate.

1 9. The method of claim 6, wherein removing material in the area of the first substrate
2 defined by the first mask comprises performing an anisotropic reactive ion etch with SF₆, HBr,
3 and oxygen gases flowing.

1 10. The method of claim 6, wherein thinning the second side of the first substrate
2 comprises a process selected from the group consisting of mechanical grinding, wet etching, and
3 plasma etching.

1 11. The method of claim 6, wherein creating a reflective surface on the second side of
2 the first substrate comprises polishing the second side of the first substrate after thinning the
3 second side of the first substrate.

1 12. The method of claim 6, wherein creating a reflective surface on the second side of
2 the first substrate comprises depositing a thin film of reflective material on the second side of the
3 first substrate after thinning the second side of the first substrate.

1 13. A method of fabricating a spatial light modulator including an array of a plurality of
2 mirrors, comprising:
3 generating a first mask defining areas to be etched from a first side of a first substrate;

4 etching the areas on the first side of the first substrate defined by the first mask to
5 form a plurality of cavities in the first side of the first substrate;
6 fabricating electrodes on a first side of a second substrate;
7 bonding the first side of the first substrate to the first side of the second substrate;
8 creating a reflective surface on the second side of the first substrate;
9 generating a second mask defining areas to be etched from the second side of the first
10 substrate; and
11 etching the areas on the second side of the first substrate defined by the second mask
12 to form a plurality of hinges and mirror plates.

1 14. The method of claim 13, wherein etching the areas on the first side of the first
2 substrate defined by the first mask to form a plurality of cavities in the first side of the first
3 substrate comprises performing an anisotropic reactive ion etch with SF₆, HBr, and oxygen
4 gases flowing.

1 15. The method of claim 13, further comprising, prior to fabricating electrodes on the
2 first side of the second substrate, fabricating control circuitry on the first side of the second
3 substrate.

1 16. The method of claim 15, wherein fabricating control circuitry on the first side of the
2 second substrate comprises fabricating a memory buffer, a display controller and a pulse width
3 modulation array.

1 17. The method of claim 15, wherein fabricating electrodes on the first side of the second
2 substrate comprises:

3 covering the fabricated control circuitry with a passivation layer;
4 depositing a metallization layer on the passivation layer;
5 patterning the metallization layer in a pattern that will define the electrodes; and
6 etching the metallization layer to leave behind the material that makes up the
7 electrodes.

1 18. The method of claim 13, further comprising, prior to bonding the first side of the first
2 substrate to the first side of the second substrate, aligning the first substrate with the second
3 substrate so that the electrodes on the second substrate are positioned to control the deflection of
4 mirrors in the first substrate when the first and second substrates are bonded together.

1 19. The method of claim 18, wherein aligning the first substrate with the second
2 substrate comprises aligning a pattern on the first substrate with a pattern on the second
3 substrate.

1 20. The method of claim 13, wherein bonding the first side of the first substrate to the
2 first side of the second substrate comprises using a low temperature bonding method performed
3 at less than approximately 500 degrees Celsius.